NOTES ON COCOONS AND PARASITES OF *MELISSODES OBLIQUA* AND NESTS OF *PERDITA OPUNTIAE* (HYMENOPTERA-APOIDEA)

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Melissodes obliqua Say

I have recently described the nests of *Melissodes obliqua* Say in The Canadian Entomologist.[1] Since then I have bred 102 cocoons, obtained from the nests of the species, with the following results:

Of the 102 cocoons, 72 contained larvæ of the host and 30, those of the parasites, revealing a parasitic ratio of approximately 30%,—or about one parasite to every two hosts. Of the 72 hosts, 48 were male and 24 were females, the males reaching maturity somewhat earlier and in larger numbers than the females. This gives a sex ratio of two to one in favor of the males. Of the thirty parasites, all died except one, *Triepeolus concavus* Cresson, which reached maturity after 10 months incubation (August to June).

Since there is no fundamental difference between the cocoon containing the host and that containing the parasite, one can conclude that this Triepeoline Bee is carnivorous.[2] For in order to develop in the cocoon of the host the parasite must have postponed its feast until the pollen and honey were consumed and the cocoon spun. It is interesting to note that the parasitic larvæ possess two rows of dorsal

[1] On the Nesting Habits of Melissodes Latr. (Hymenop.). Canadian Entom., vol. 60, p. 28, 2 figs. (1928).

[2] Reinhard, in a recent publication on wasps, states that the cocoon of the parasite, *Nysson hoplisivora,* is indistinguishable from that of its host, *Hoplisus costalis,* except for its slightly smaller size. If his observations are correct, my conclusions must be regarded with reservations. Only time can reveal the answer. The problems of parasitism have, to say the least, wide fields for future study.

tubercles which are more highly developed than in the case of the host.

The average cocoon is 15 x 7.3 mm. (extremes 13 to 17 and 7 to 7.5 respectively) ; shape cylindrical, the ends symmetrically rounded; color dark brown; upper end covered by cap of excrement 3 mm in thickness; below this, four or five closely related, thin, shining, light amber-colored membranes of a circular shape moderately interwoven with brown fibrils; below this, the domeshaped roof of the cocoon, dark amber-colored, more abundantly supplied with fibrils and presenting a dull finish internally; wall of cocoon composed of three layers from without inward as follows: (1) Thin dull brownish membrane closely adherent to clay wall of cell; (2) Thick dull brownish membrane; (3) Very thin, glistening, light amber-colored membrane sparsely supplied with interlacing fibrils.

In the first paper, I remarked that there were large numbers of parasites flying about and entering the nests of *Melissodes obliqua* Say. The parasitic ratio of 30%, as shown by the incubation of the cocoons, tends to bear this out. However, in view of the fact that 29 of the 30 parasitic larvae failed to reach maturity (possibly due to my transferring them from an incubator at 28° C. to room temperature) I have no doubt that there are other species of *Triepeolus* besides *concavus*, which are parasitic on this bee. It is such a set of mortality statistics which so often brings our experiments in the incubation of the larvæ of wild bees to an unfortunate conclusion.

Perdita opuntiæ Cockerell

In my paper in Psyche,[1] concerning the nests of *Perdita opuntiæ*, it appears that there is room for some misunderstanding as to whether the bee actually nests in firm stone or makes use of various cracks and faults in which to construct its tunnelways. Mr. S. A. Rohwer, of the United States Department of Agriculture, in particular has called

[1]The Bee That Works in Stone; *Perdita opuntiæ* Ckll. Psyche, vol. 35, No. 2, pp. 67-84. (1928).

my attention to the fact and states that the paper gives "the impression that the bee would not be able to live within the stone if it were not for some crack or fault on its surface".

No doubt the misinterpretation arose from Fig. 1 which represented a typical nest, all of the tunnelways being in the same plane. The entrances to this particular nest *were* in a crack. I had chosen it for the illustration because I could show all the ramifications of the tunnelways in two dimensions. In this respect it was not a typical nest.

The actual condition is this: Dozens of nests of *Perdita opuntiæ* are found in the firm stone at White Rocks, Colorado. Each nest has two or more entrances. In a small percent. of the nests the entrances are found in cracks or faults in the stone. *But in the majority of the nests the entrances are situated in solid stone in the immediate vicinity of which there is not the slightest sign of a crack or fault.* In these latter nests one finds the entrances irregularly distributed over the surface of the stone in such a manner that they could not be connected together by a crack. Also upon excavating these nests one finds that the tunnelways are not confined to individual planes (as would be the case if they were in faults) but ramify in all three dimensions throughout the stone. So there is no doubt that the bee actually nests in solid stone.

I might mention in passing that in the original paper, page 75, I stated that I had found no report in the literature of a wasp digging its nest in stone. Since then I have learned from Dr. Davidson, in California, that years ago he had published a paper describing the habits of a wasp that nested in a soft sandstone.